FCC Radio Test Report

FCC ID: 2AJZR-T605B00

This report concerns (check one): ☒**Original Grant** ☐**Class II Change**

Project No.	:	1607235
Equipment	:	Premium Docking Station
Model Name	:	iSAPPOS 9B
Applicant	:	iSAPPOS Systems Company Limited
Address	:	Rm 08, 5/F., Block B, Hoplite Industrial Centre, No. 3 -5 Wang Tai Road, Kowloon Bay, Hong Kong SAR

Date of Receipt	:	Jul. 26, 2016
Date of Test	:	Jul. 26, 2016 ~ Aug. 16, 2016
Issued Date	:	Aug. 17, 2016
Tested by	:	BTL Inc.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-1-1607235	Original Issue.	Aug. 17, 2016

1. CERTIFICATION

Equipment	:	Premium Docking Station
Brand Name	:	N/A
Model Name	:	iSAPPOS 9B
Applicant	:	iSAPPOS Systems Company Limited
Manufacturer	:	iSAPPOS Systems Company Limited
Address	:	Rm 08, 5/F., Block B, Hoplite Industrial Centre, No. 3 – 5 Wang Tai Road, Kowloon Bay, Hong Kong SAR
Factory	:	FLYTECH TECHNOLOGY CO., LTD.
Address	:	No.36, Huaya 3rd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
Date of Test	:	Jul. 19, 2016 ~ Aug. 16, 2016
Test Sample	:	Engineering Sample
Standard(s)	:	FCC Part15, Subpart C (15.247) / ANSI C63.10-2013

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1607235) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

Applied Standard(s): FCC Part15 (15.247) , Subpart C,			
Standard(s) Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(d)	Antenna conducted Spurious Emission	PASS	
15.247(a)(2)	6dB Bandwidth	PASS	
15.247(b)(3)	Peak Output Power	PASS	
15.247(e)	Power Spectral Density	PASS	
15.203	Antenna Requirement	PASS	
15.247(d)/15.209/15.205	Transmitter Radiated Emissions	PASS	

NOTE:

(1)" N/A" denotes test is not applicable to this device.

(2) The test follows FCC KDB Publication No. 558074 D01 DTS Meas Guidance v03r05 (Measurement Guidelines of DTS)

2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

Conducted emission Test:

C05: (VCCI RN: C-4742; FCC RN:949005; FCC DN:TW1082)
No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

Radiated emission Test (Below 1GHz):

CB11: (VCCI RN: R-4260; FCC RN:949005; FCC DN:TW1082; IC Assigned Code:20088)
No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

Radiated emission Test (Above 1GHz):

CB11: (VCCI RN: G-868; FCC RN:949005; FCC DN:TW1082; IC Assigned Code:20088)
No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.
The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

The reported uncertainty of measurement **y** ± **U**, where expanded uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U, (dB)
C05	CISPR	150 kHz~30MHz	2.04

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U, (dB)
CB11 (3m)	CISPR	9kHz ~ 150kHz	4.00
		150kHz ~ 30MHz	4.00

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
CB11 (3m)	CISPR	30 MHz ~ 200 MHz	V	3.06
		30 MHz ~ 200 MHz	H	2.58
		200 MHz ~ 1, 000 MHz	V	3.50
		200 MHz ~ 1, 000 MHz	H	3.10

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
CB11 (3m)	CISPR	1GHz ~ 6GHz	V	4.14
		1GHz ~ 6GHz	H	4.14

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
CB11 (1m)	CISPR	6GHz ~ 18GHz	V	5.34
		6GHz ~ 18GHz	H	5.34

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.
Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.
Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR}, as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz : 3.6 dB
Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz : 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR}.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Premium Docking Station	
Brand Name	N/A	
Model Name	iSAPPOS 9B	
Model Difference	N/A	
Power Source	DC voltage supplied from AC/DC adapter.	
Power Rating	I/P:100-240V~ 1.0A 50-60Hz O/P: DC 5V⎓4A	
Products Covered	1 * Panel: 9.7” 1 * RF Module: TEXAS INSTRUMENTS / CC2541 1 * AC/DC Adapter: EDAC / EA1024CR-050	
Product Description	Operation Frequency	2402~2480 MHz
	Modulation Technology	GFSK(1Mbps)
	Bit Rate of Transmitter	
	Output Power (Max.)	0.17dBm (1Mbps)

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the user's manual.

2. Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Brito BRITO TECHNOLOGY 昀陽科技有限公司	WLAN Embedded Antenna	Dipole	I-PEX	2.46

3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode **NOTE (1)**
Mode 2	Bluetooth

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Conducted Test	
Final Test Mode	Description
Mode 2	Bluetooth

For Radiated Test	
Final Test Mode	Description
Mode 1	TX Mode **NOTE (1)**

Note:

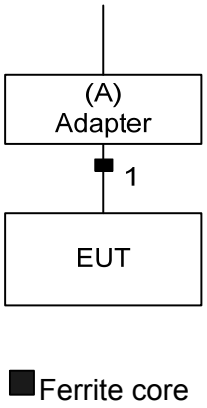
(1) The measurements are performed at the high, middle, low available channels.

3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of bluetooth LE.

Test Software Version	SmartRF Studio7		
Frequency (MHz)	2402	2440	2480
BT LE	9	9	9

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
A	Adapter	EDAC	EA1024CR-050	DOC	87DW45D04L7

Item	Shielded Type	Ferrite Core	Length	Note
1	YES	YES	1.8m	Power Cable

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSION LIMITS (Frequency Range 150KHz-30MHz)

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 -0.	66 to 56*	56 to 46*
0 50 -5.0	56	46
5.0 -30.0	60	50

Note:

(1) The limit of " * " decreases with the logarithm of the frequency

(2) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

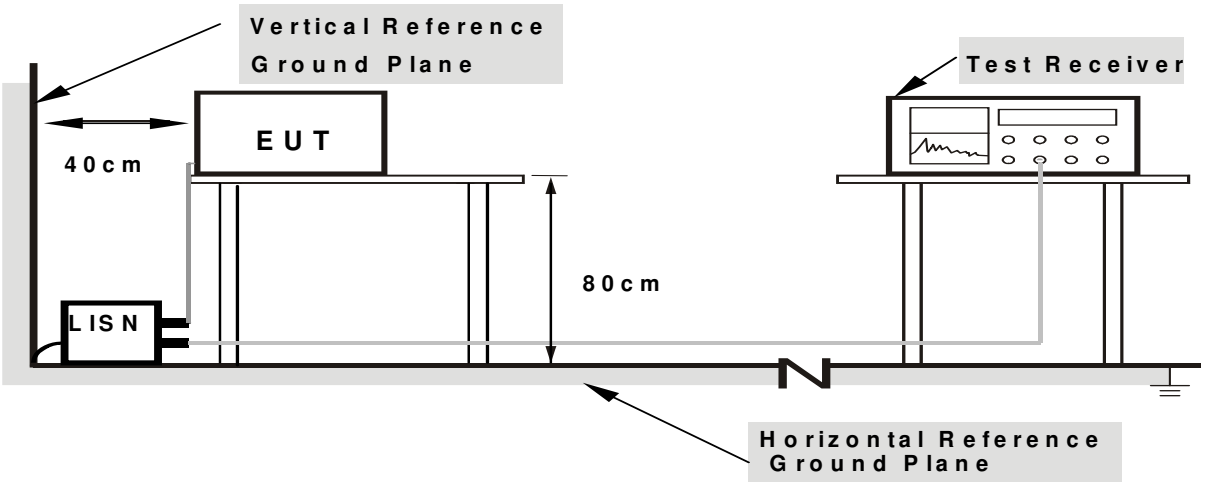
4.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical function (as a customer would normally use it), EUT was programmed to be in continuously transmitting/receiving data or hopping on mode.

4.1.6 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 55%
Test Voltage: AC 120V/60Hz

4.1.7 TEST RESULTS

Please refer to the Attachment A.

Remark:

(1) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform.In this case, a " * " marked in AVG Mode column of Interference Voltage Measured.
(2) Measuring frequency range from 150KHz to 30MHz.
(3) " N/A" denotes test is not applicable to this device.

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 RADIATED EMISSION LIMITS

In case the emission fall within the restricted band specified on 15.205(a) then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (9KHz-1000MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Frequency (MHz)	(dBuV/m) (at 3 meters)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

(4) The test result calculated as following:

Measurement Value = Reading Level + Correct Factor

Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)

Margin Level = Measurement Value - Limit Value

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	RBW 1MHz VBW 3MHz peak detector for Pk value RMS detector for AV value

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

4.2.2 TEST PROCEDURE

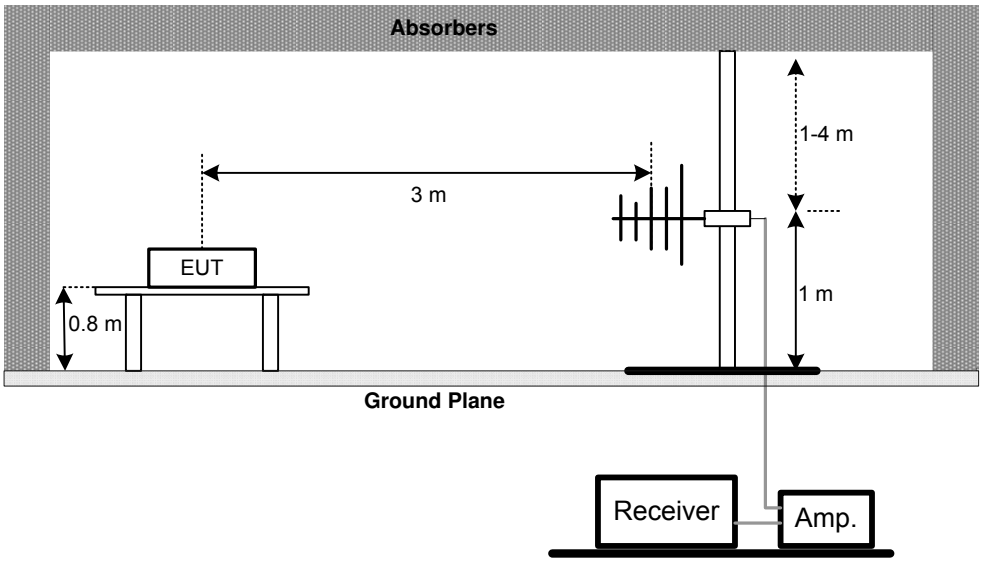
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1GHz)
i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

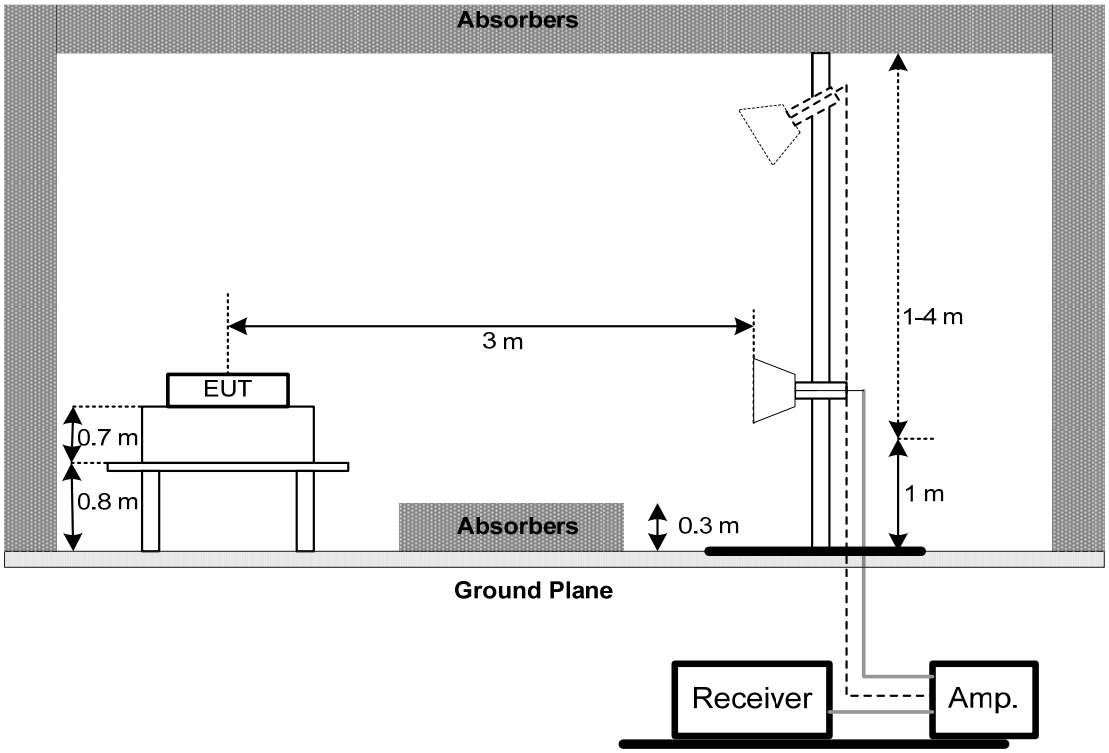
No deviation

4.2.4 TEST SETUP

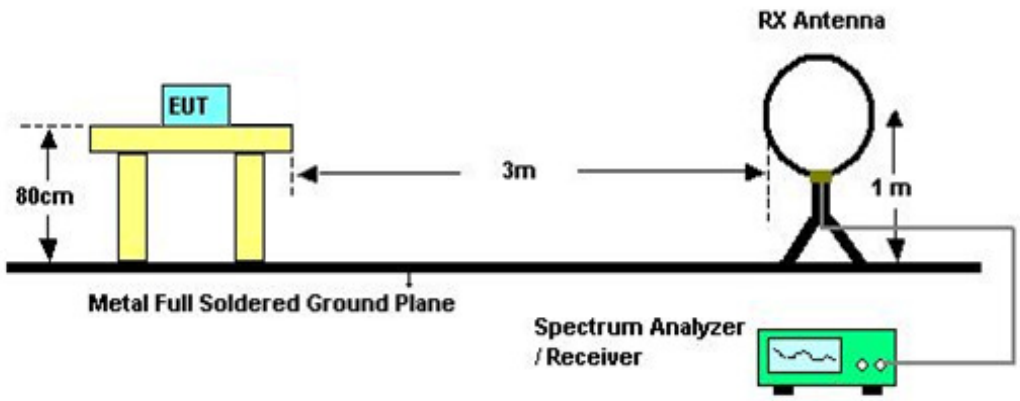
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



(C) For radiated emissions below 30MHz



4.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.5** unless otherwise a special operating condition is specified in the follows during the testing.

4.2.6 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 45%
Test Voltage: AC 120V/60Hz

4.2.7TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the Attachment B

Remark:

(1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
(2) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
(3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8TEST RESULTS (30MHZ TO 1000 MHZ)

Please refer to the Attachment C.

Remark:

(1) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
(2) Measuring frequency range from 30MHz to 1000MHz.
(3) If the peak scan value lower limit more than 20dB, then this signal data does not show in table.

4.2.9TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Attachment D.

Remark:

(1) All readings are Peak unless otherwise stated QP in column of『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
(2) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission
(3) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
(4) EUT Orthogonal Axis:
"X" - denotes Laid on Table；"Y" - denotes Vertical Stand；"Z" - denotes Side Stand
(5) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
(6) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. BANDWIDTH TEST

5.1 Applied procedures / limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 2.5 ms.

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP

5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 60%
Test Voltage: AC 120V/60Hz

5.1.6 TEST RESULTS

Please refer to the Attachment E.

6. MAXIMUM OUTPUT POWER TEST

6.1 Applied procedures / limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Maximum Output Power	1 watt or 30dBm	2400-2483.5	PASS

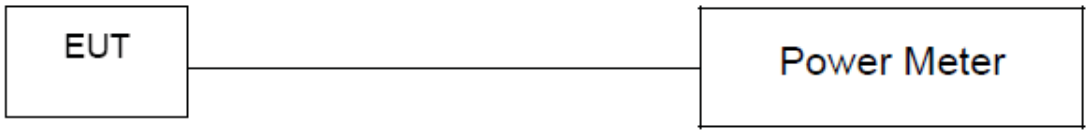
6.1.1 TEST PROCEDURE

a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
b. The maximum peak conducted output power was performed in accordance with method 9.1.2 of FCC KDB 558074 D01 DTS Meas Guidance v03r05.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.
Transmit output power was measured while the host equipment supply voltage was varied from 85 % to 115 % of the nominal rated supply voltage. No change in transmit output power was observed.

6.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 60%
Test Voltage: AC 120V/60Hz

6.1.6 TEST RESULTS

Please refer to the Attachment F.

7. ANTENNA CONDUCTED SPURIOUS EMISSION

7.1 Applied procedures / limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that transmitter demonstrates compliance with the peak conducted power limits.

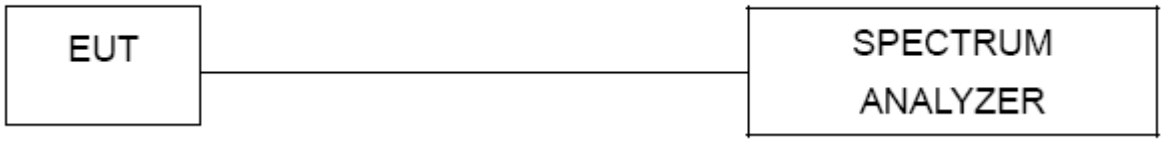
7.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 10 ms.
c. Offset=antenna gain+ cable loss

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

7.1.5 EUT OPERATION CONDITIONS

Temperature: 25°C
Relative Humidity: 60%
Test Voltage: AC 120V/60Hz

7.1.6 TEST RESULTS

Please refer to the Attachment G.

8. POWER SPECTRAL DENSITY TEST

8.1 Applied procedures / limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

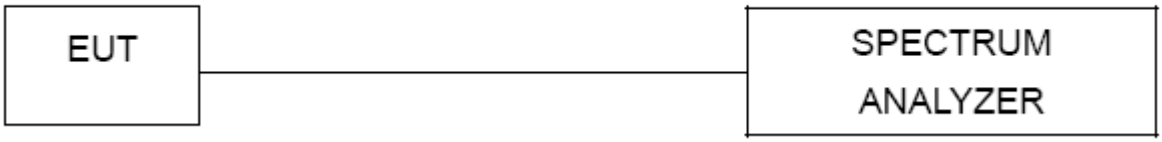
8.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW=3KHz, VBW=10 KHz, Sweep time = auto.

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 unless otherwise a special operating condition is specified in the follows during the testing.

8.1.5 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 60%
Test Voltage: AC 120V/60Hz

8.1.6 TEST RESULTS

Please refer to the Attachment H.

9. MEASUREMENT INSTRUMENTS LIST

Conducted Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	TWO-LINE V-NETWORK	R&S	ENV216	101050	Jan. 26, 2017
2	Test Cable	TIMES	CFD300-NL	C02	Jun. 13, 2017
3	EMI Test Receiver	R&S	ESR7	101433	Dec. 09, 2016
4	Power Dividers	HP	11636A	8103	May 03, 2017
5	Measurement Software	EZ	EZ_EMC (Version NB-03A)	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jul. 29, 2017
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Apr. 19, 2017
3	Horn Antenna	Schwarzbeck	BBHA 9120	9120D-1333	May 19, 2017
4	Pre-Amplifier	Anritsu	MH648A	M92649	Jun. 15, 2017
5	Pre-Amplifier	Agilent	8449B	3008A01714	Apr. 13, 2017
6	Test Cable	LMR	LMR-400	01(10M)	May 11, 2017
7	Test Cable	LMR	LMR-400	01(3M)	May 11, 2017
8	Test Cable	Harbour industries	27478LL142	1M	May 12, 2017
9	Test Cable	Harbour industries	27478LL142	3M	May 12, 2017
10	Test Cable	AISI	S104-SMAP-1	8M	May 12, 2017
11	Spectrum Analyzer	Agilent	N9020A	MY51160196	Aug. 01, 2017
12	EMI Test Receiver	R&S	ESCI	100080	May 12, 2017
13	Measurement Software	Farad	EZ_EMC (Version NB-03A)	N/A	N/A

6dB Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Keysight	N9010A	MY54200240	Aug. 26, 2016

Peak Output Power Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2487A	6K00004714	May 18, 2017
2	Power Meter Sensor	Anritsu	MA2491A	034138	May 17, 2017

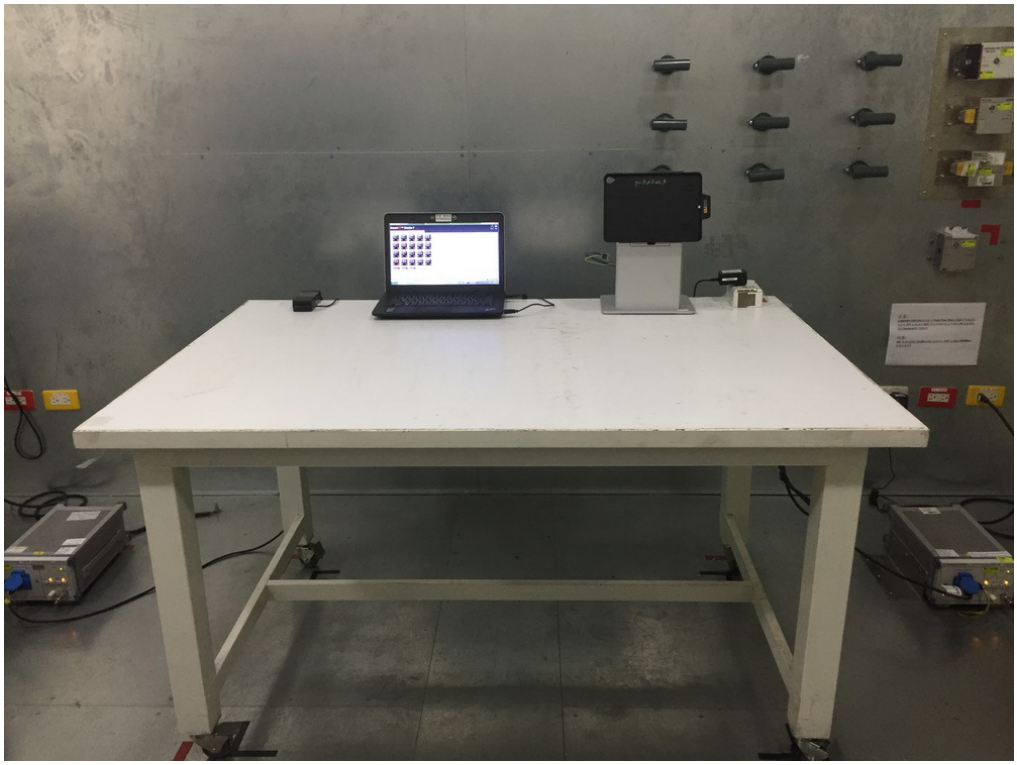
Antenna Conducted Spurious Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Keysight	N9010A	MY54200240	Aug. 26, 2016

Power Spectral Density Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Keysight	N9010A	MY54200240	Aug. 26, 2016

Remark: ”N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

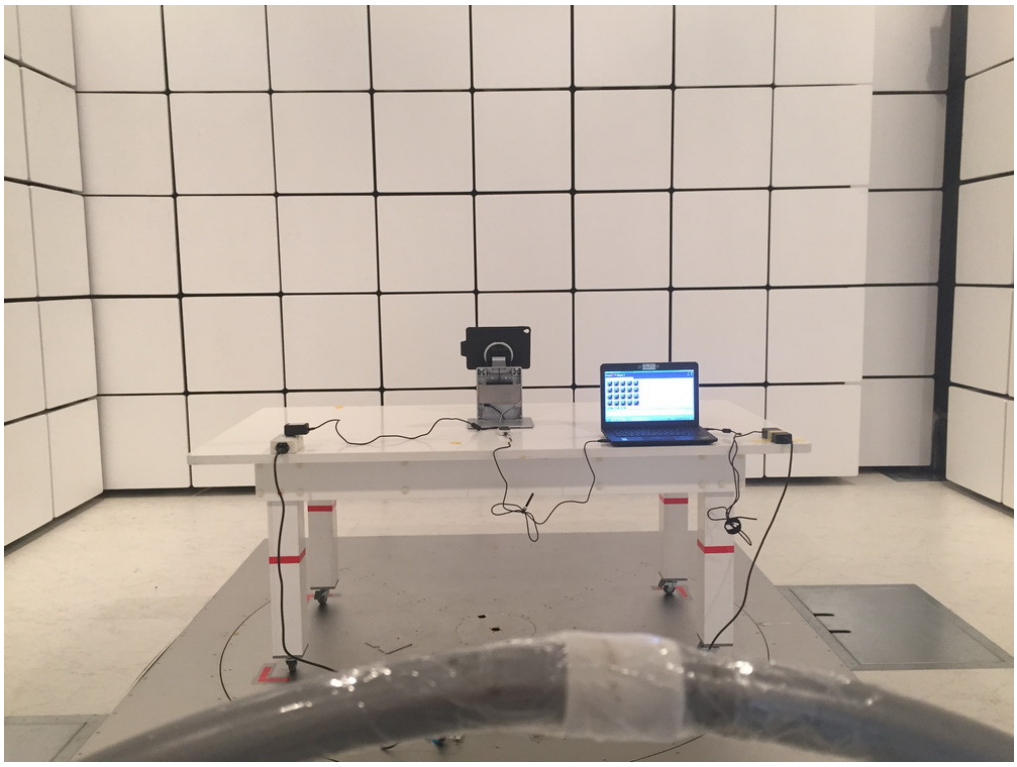
10. EUT TEST PHOTO

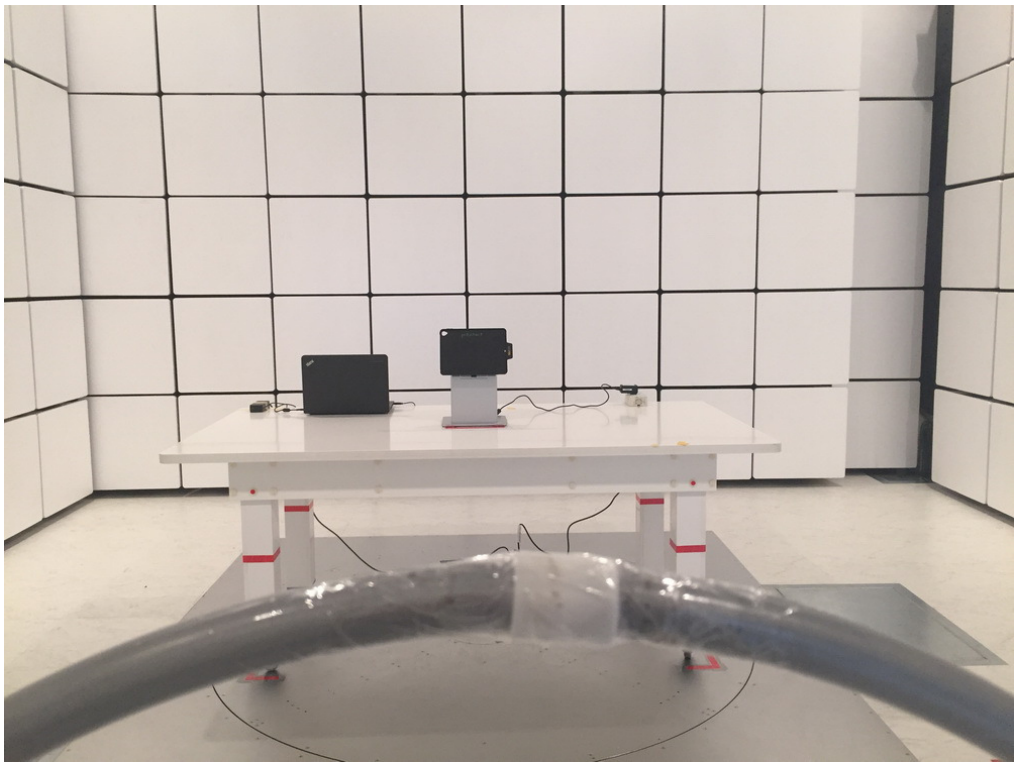
Conducted Measurement Photos



Radiated Measurement Photos

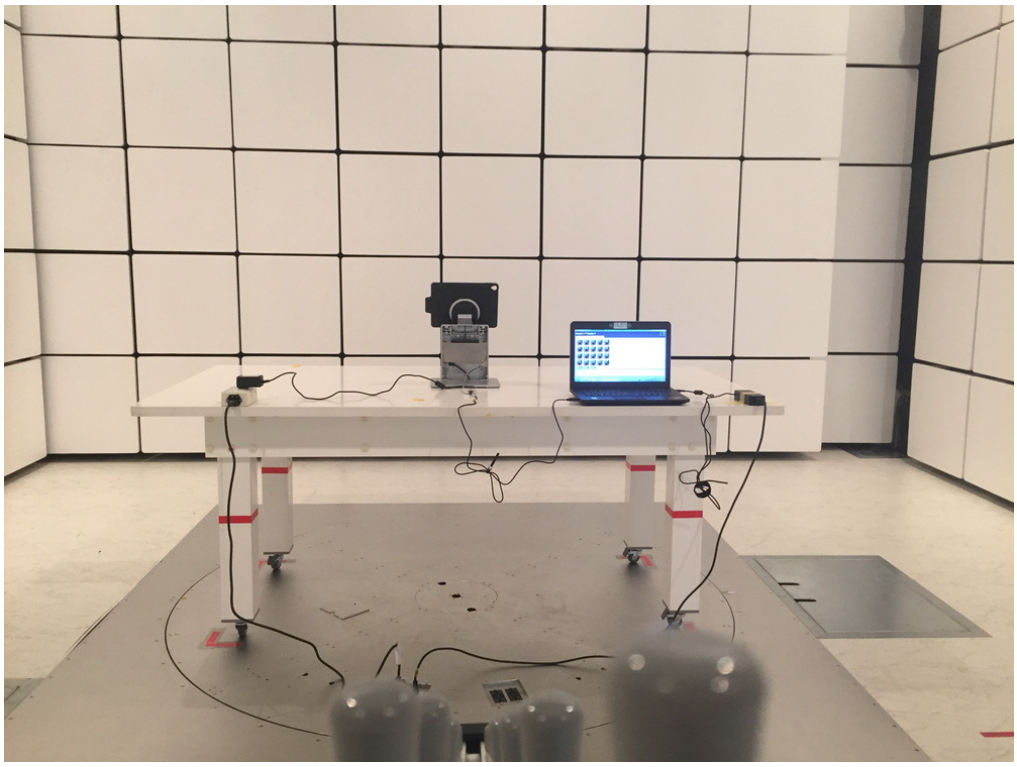
9KHz to 30MHz

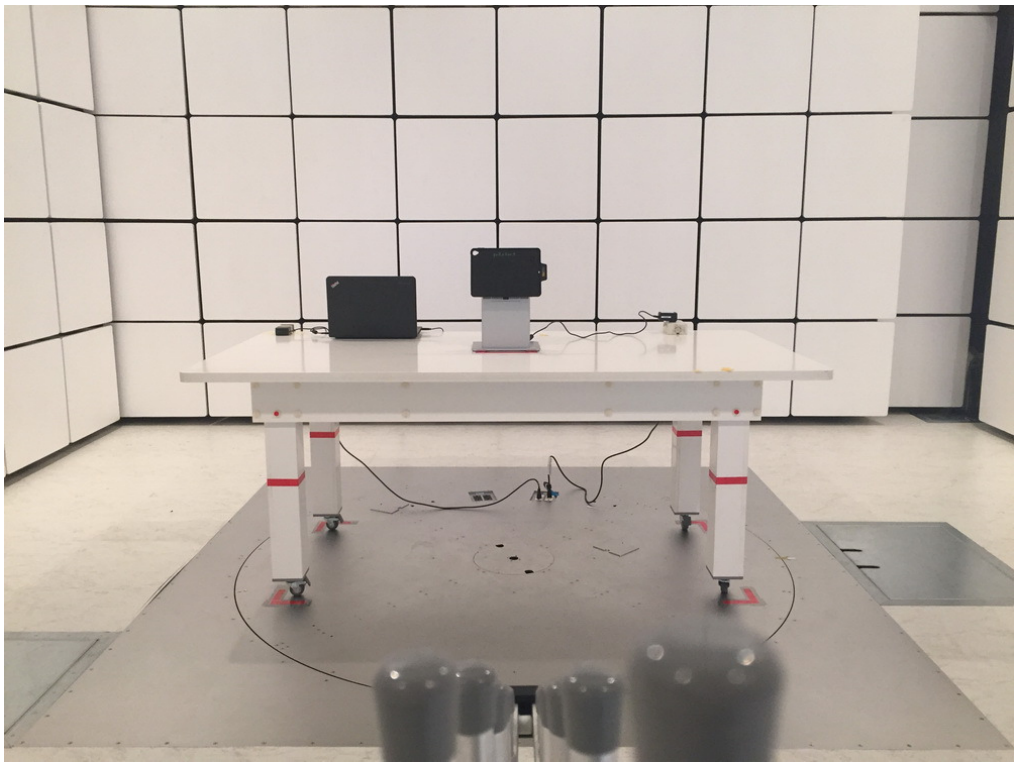




Radiated Measurement Photos

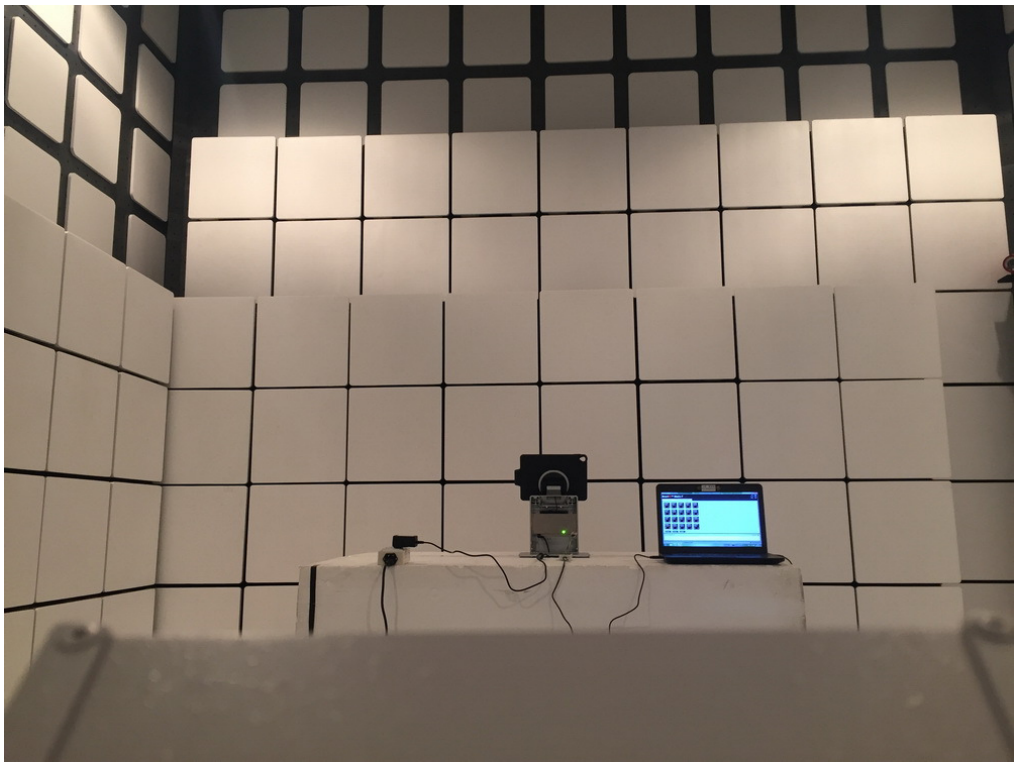
30MHz to 1000MHz





Radiated Measurement Photos

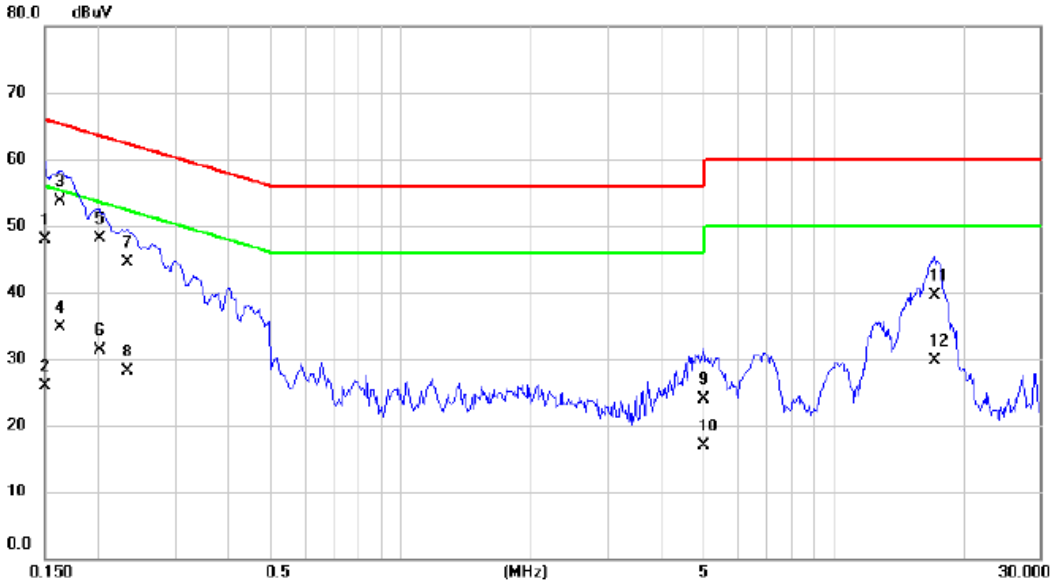
Above 1000MHz



ATTACHMENT A - CONDUCTED EMISSION

Test Mode:	Bluetooth

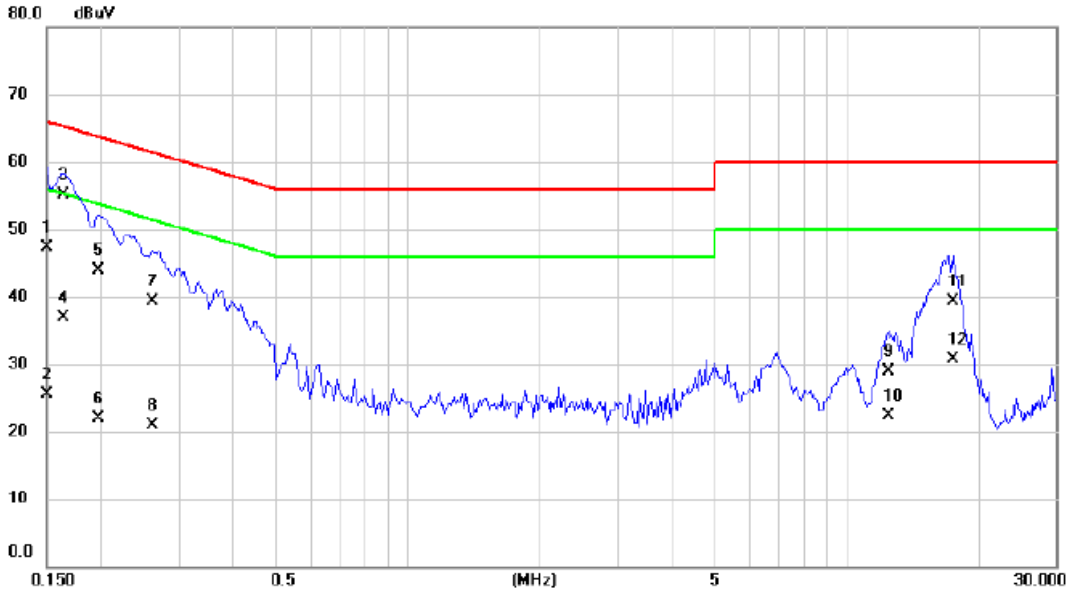
Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	38.30	9.66	47.96	66.00	-18.04	QP	
2		0.1500	16.20	9.66	25.86	56.00	-30.14	AVG	
3	*	0.1626	44.00	9.66	53.66	65.33	-11.67	QP	
4		0.1626	25.00	9.66	34.66	55.33	-20.67	AVG	
5		0.2004	38.40	9.66	48.06	63.59	-15.53	QP	
6		0.2004	21.70	9.66	31.36	53.59	-22.23	AVG	
7		0.2326	34.80	9.66	44.46	62.36	-17.90	QP	
8		0.2326	18.40	9.66	28.06	52.36	-24.30	AVG	
9		5.0000	14.00	9.82	23.82	56.00	-32.18	QP	
10		5.0000	7.10	9.82	16.92	46.00	-29.08	AVG	
11		17.1000	29.50	9.95	39.45	60.00	-20.55	QP	
12		17.1000	19.70	9.95	29.65	50.00	-20.35	AVG	

Test Mode:	Bluetooth

Neutral

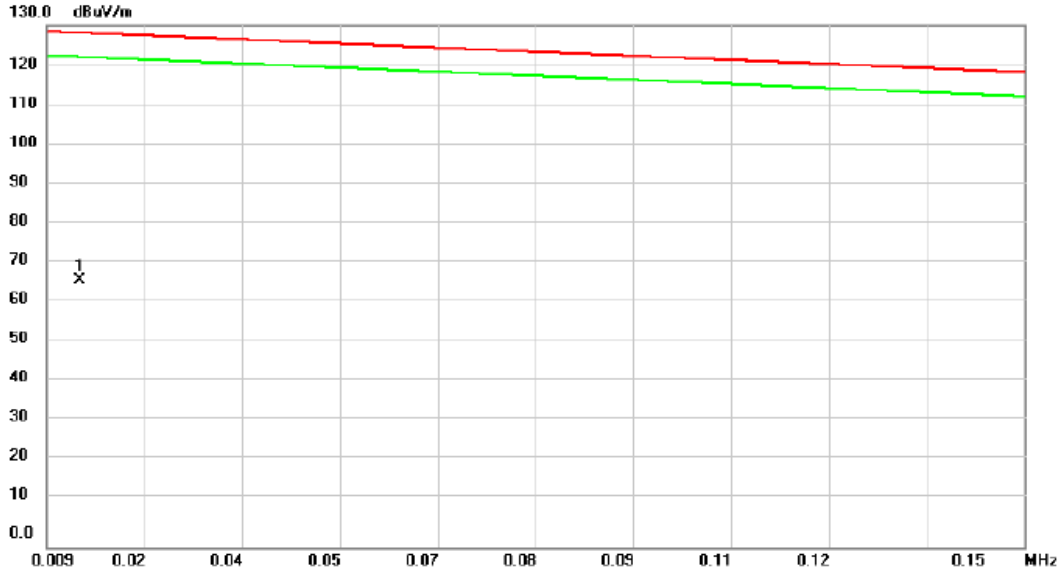


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	37.70	9.67	47.37	66.00	-18.63	QP	
2		0.1500	15.80	9.67	25.47	56.00	-30.53	AVG	
3	*	0.1633	45.50	9.67	55.17	65.29	-10.12	QP	
4		0.1633	27.20	9.67	36.87	55.29	-18.42	AVG	
5		0.1970	34.30	9.66	43.96	63.74	-19.78	QP	
6		0.1970	12.20	9.66	21.86	53.74	-31.88	AVG	
7		0.2613	29.60	9.66	39.26	61.39	-22.13	QP	
8		0.2613	11.30	9.66	20.96	51.39	-30.43	AVG	
9		12.4500	19.10	9.88	28.98	60.00	-31.02	QP	
10		12.4500	12.40	9.88	22.28	50.00	-27.72	AVG	
11		17.5000	29.40	9.95	39.35	60.00	-20.65	QP	
12		17.5000	20.70	9.95	30.65	50.00	-19.35	AVG	

ATTACHMENT B - RADIATED EMISSION (9KHZ TO 30MHZ)

Test Mode:	TX Mode

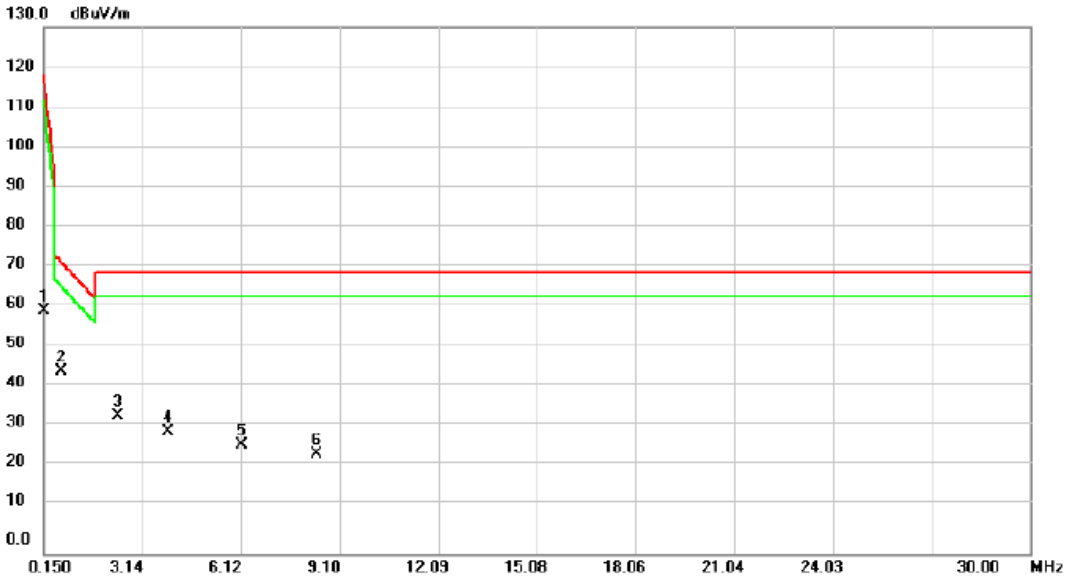
OPEN



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0137	47.07	19.48	66.55	128.18	-61.63	peak	

Test Mode:	TX Mode

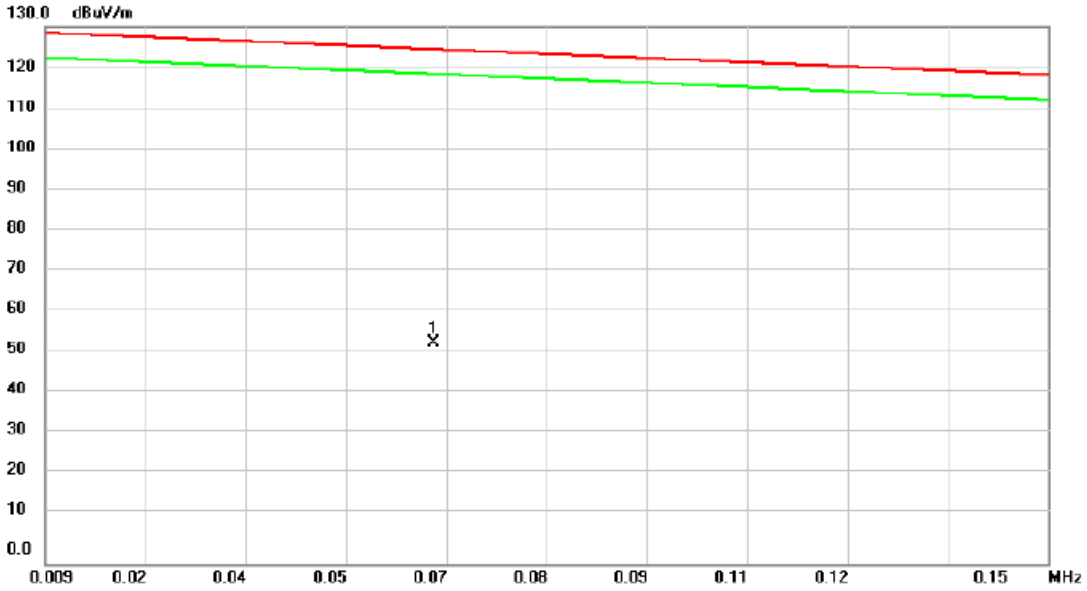
OPEN



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.1500	47.93	12.03	59.96	118.34	-58.38	peak	
2	*	0.6873	33.26	11.87	45.13	72.04	-26.91	peak	
3		2.3887	22.56	11.38	33.94	69.54	-35.60	peak	
4		3.9110	18.67	11.24	29.91	69.54	-39.63	peak	
5		6.1497	15.55	11.38	26.93	69.54	-42.61	peak	
6		8.4184	13.23	11.33	24.56	69.54	-44.98	peak	

Test Mode:	TX Mode

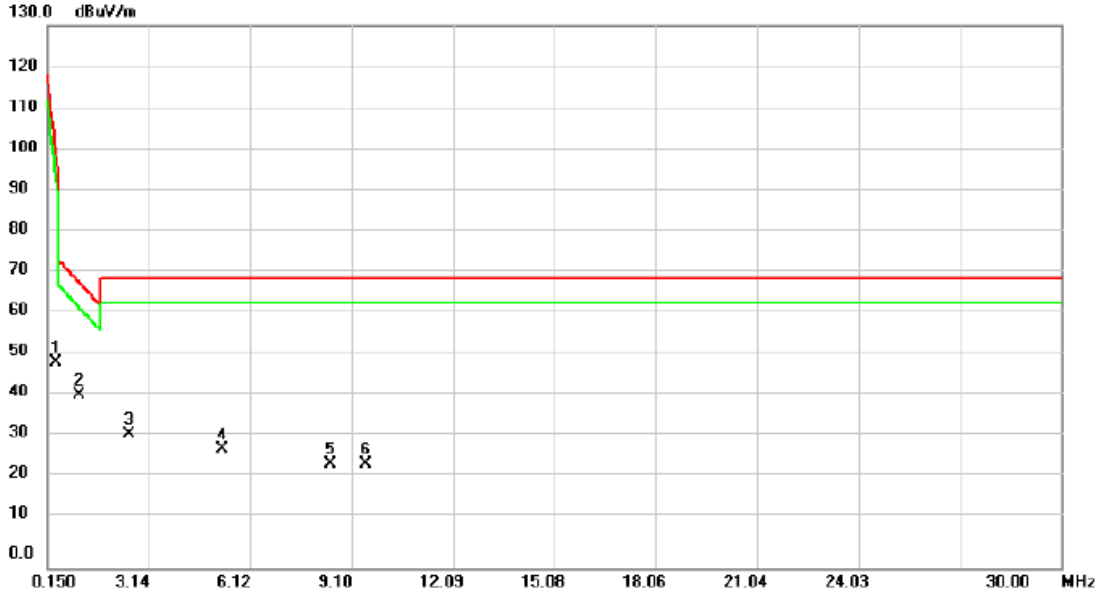
CLOSE



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.0637	40.61	12.75	53.36	124.57	-71.21	peak	

Test Mode:	TX Mode

CLOSE

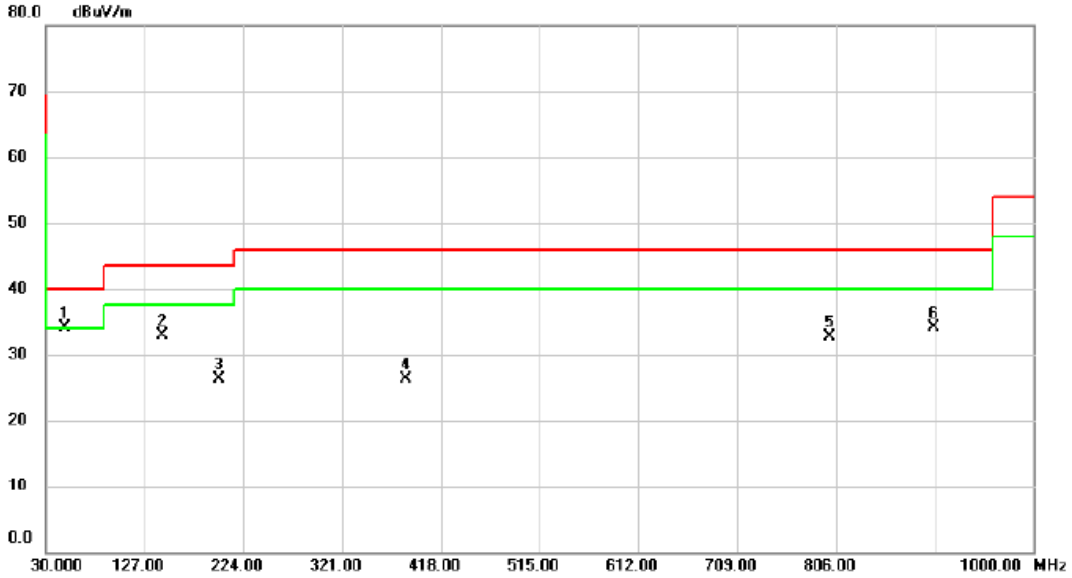


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.4187	37.60	11.80	49.40	98.95	-49.55	peak	
2	*	1.1050	29.36	11.95	41.31	68.32	-27.01	peak	
3		2.5678	20.57	11.29	31.86	69.54	-37.68	peak	
4		5.2842	16.97	11.39	28.36	69.54	-41.18	peak	
5		8.4780	13.54	11.33	24.87	69.54	-44.67	peak	
6		9.5228	13.44	11.31	24.75	69.54	-44.79	peak	

ATTACHMENT C - RADIATED EMISSION (30MHZ TO 1000MHZ)

Test Mode:	TX Mode

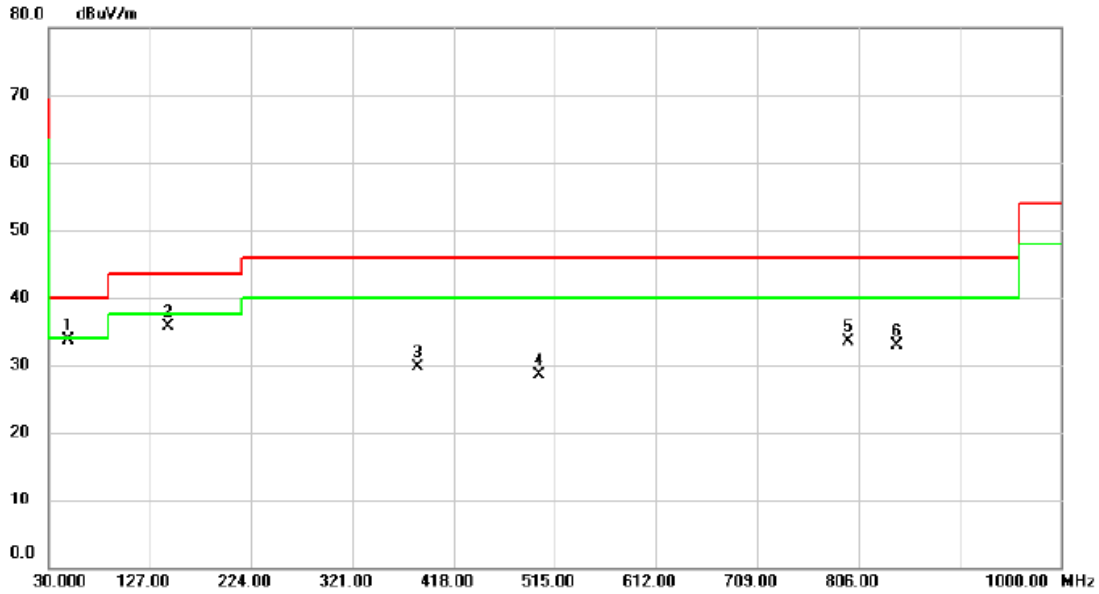
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	48.4300	42.36	-8.25	34.11	40.00	-5.89	peak	
2		144.4600	41.50	-8.69	32.81	43.50	-10.69	peak	
3		199.7500	37.14	-10.80	26.34	43.50	-17.16	peak	
4		384.0500	31.64	-5.25	26.39	46.00	-19.61	peak	
5		800.1800	29.74	2.88	32.62	46.00	-13.38	peak	
6		902.0300	29.47	4.64	34.11	46.00	-11.89	peak	

Test Mode:	TX Mode

Horizontal

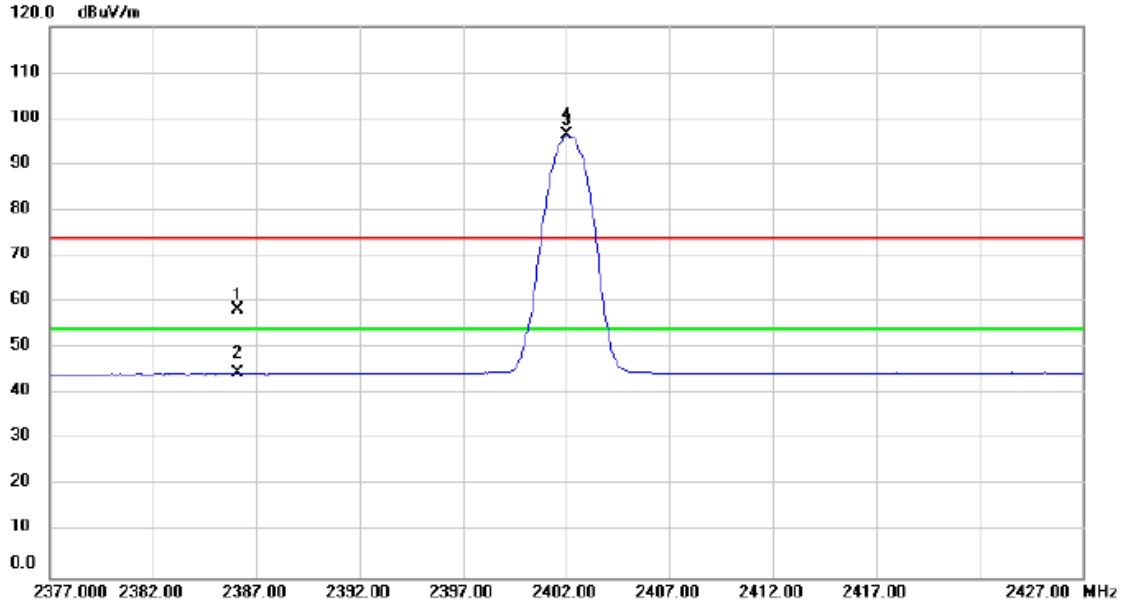


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	48.4300	42.04	-8.25	33.79	40.00	-6.21	peak	
2		144.4600	44.32	-8.69	35.63	43.50	-7.87	peak	
3		384.0500	34.95	-5.25	29.70	46.00	-16.30	peak	
4		499.4800	31.16	-2.66	28.50	46.00	-17.50	peak	
5		796.3000	30.70	2.84	33.54	46.00	-12.46	peak	
6		842.8600	29.49	3.49	32.98	46.00	-13.02	peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

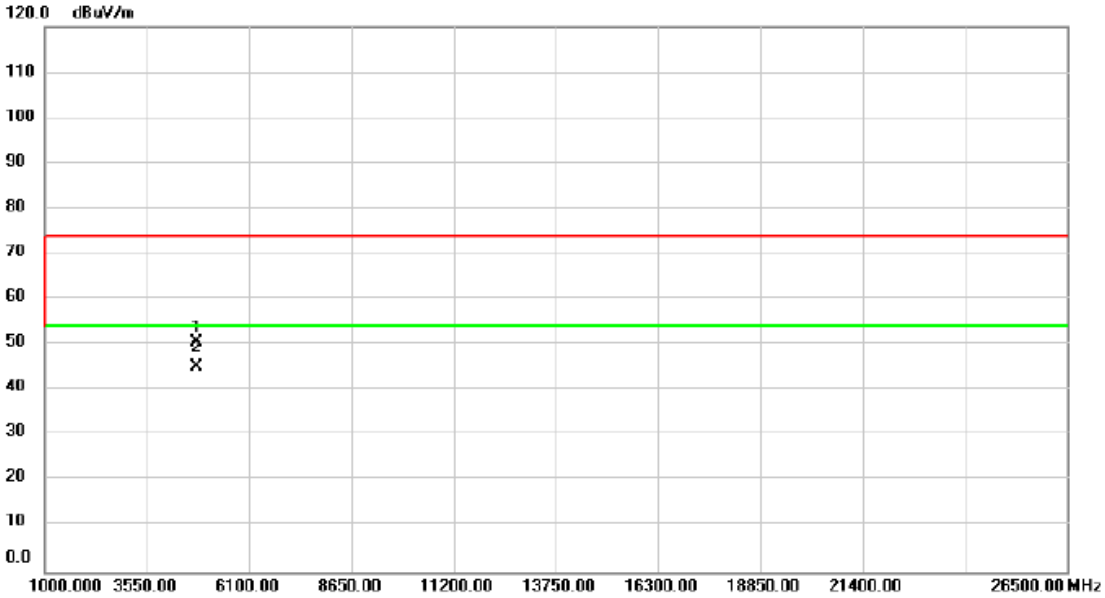
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2386.100	26.72	31.69	58.41	74.00	-15.59	peak	
2		2386.100	12.86	31.69	44.55	54.00	-9.45	AVG	
3	X	2402.000	64.75	31.76	96.51	74.00	22.51	peak	No Limit
4	*	2402.000	64.67	31.76	96.43	54.00	42.43	AVG	No Limit

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

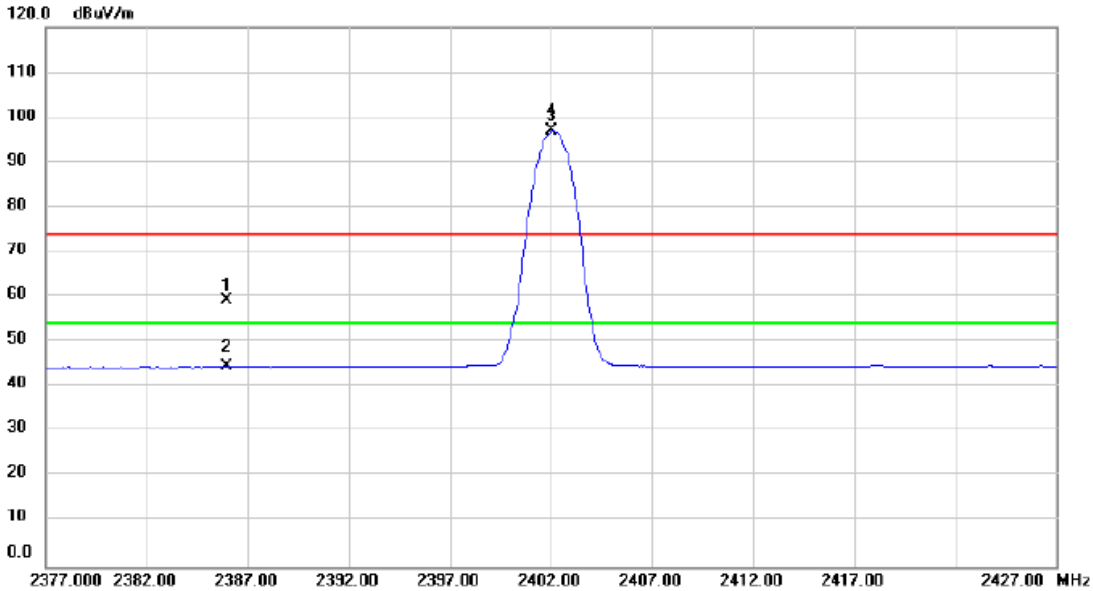
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	60.99	-10.51	50.48	74.00	-23.52	peak	
2	*	4804.000	55.70	-10.51	45.19	54.00	-8.81	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

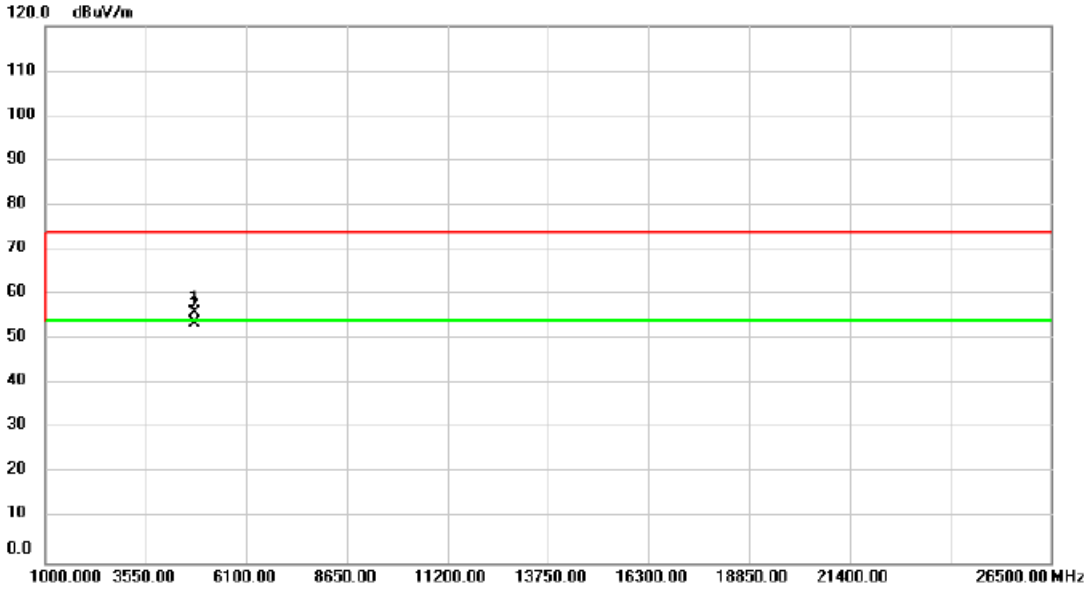
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2385.950	27.58	31.69	59.27	74.00	-14.73	peak	
2		2385.950	12.87	31.69	44.56	54.00	-9.44	AVG	
3	X	2402.000	65.30	31.76	97.06	74.00	23.06	peak	No Limit
4	*	2402.000	65.24	31.76	97.00	54.00	43.00	AVG	No Limit

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

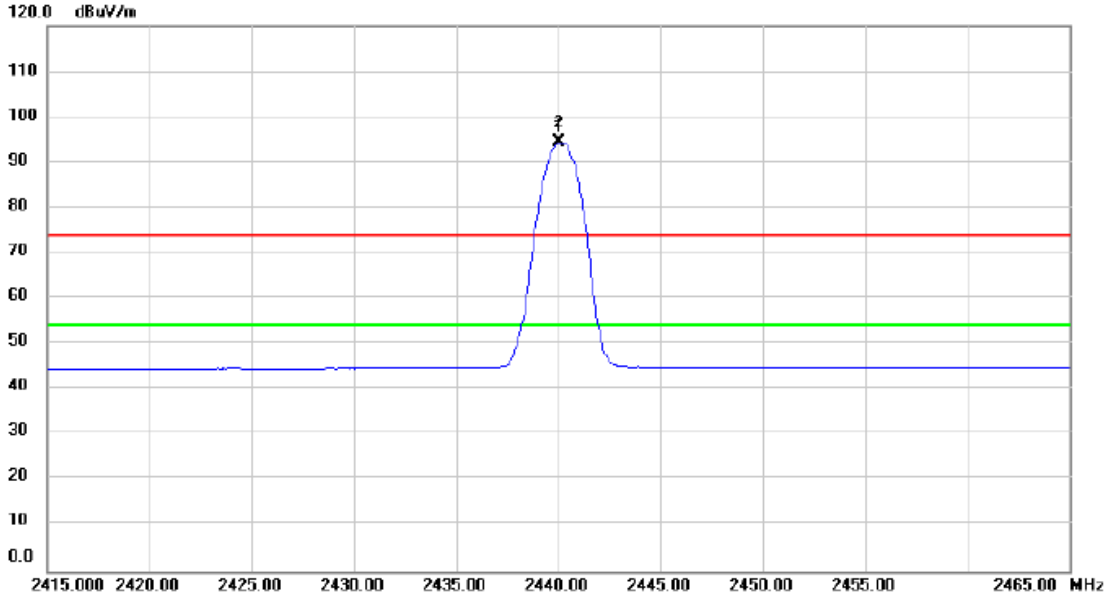
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	66.50	-10.51	55.99	74.00	-18.01	peak	
2	*	4804.000	64.04	-10.51	53.53	54.00	-0.47	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2440MHz _CH19_1Mbps

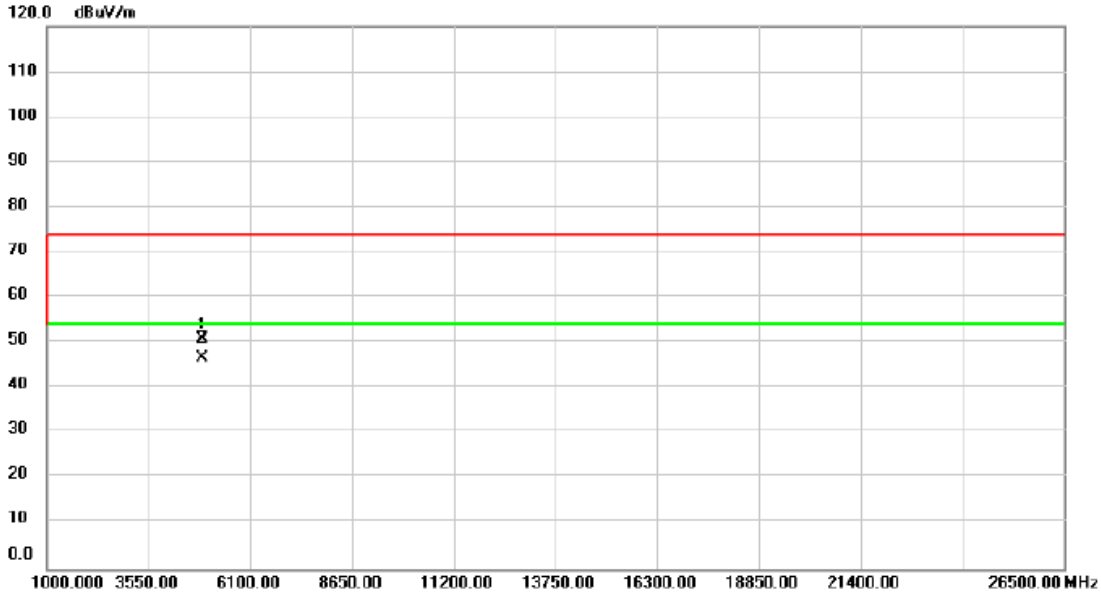
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2440.000	62.68	31.90	94.58	74.00	20.58	peak	No Limit
2	*	2440.000	62.60	31.90	94.50	54.00	40.50	AVG	No Limit

Orthogonal Axis :	X
Test Mode :	TX 2440MHz _CH19_1Mbps

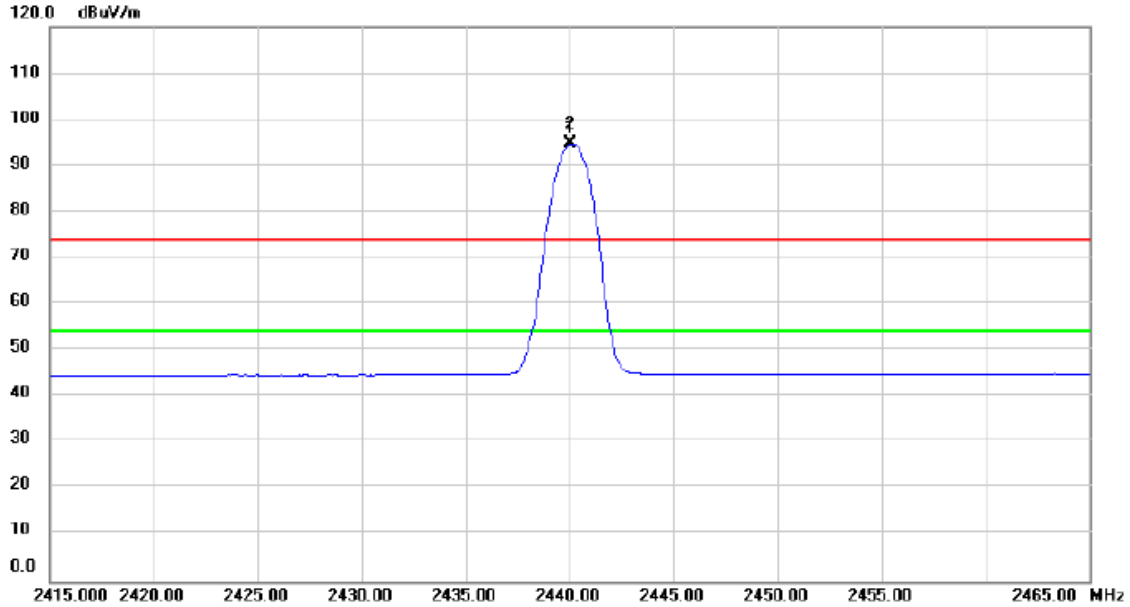
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	61.30	-10.39	50.91	74.00	-23.09	peak	
2	*	4880.000	56.91	-10.39	46.52	54.00	-7.48	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2440MHz _CH19_1Mbps

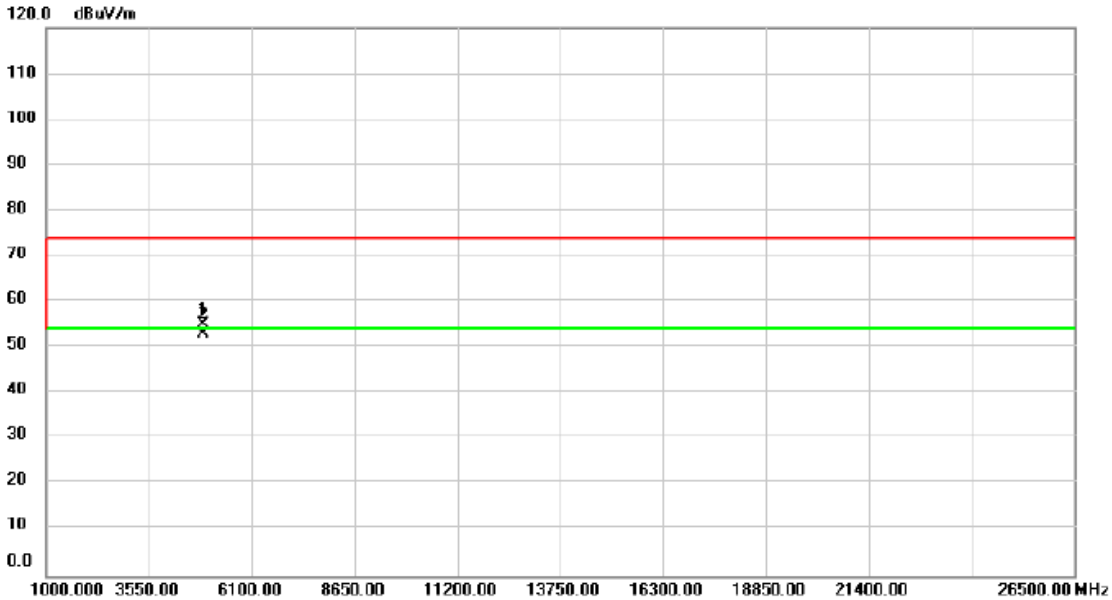
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2440.000	62.96	31.90	94.86	74.00	20.86	peak	No Limit
2	*	2440.000	62.89	31.90	94.79	54.00	40.79	AVG	No Limit

Orthogonal Axis :	X
Test Mode :	TX 2440MHz _CH19_1Mbps

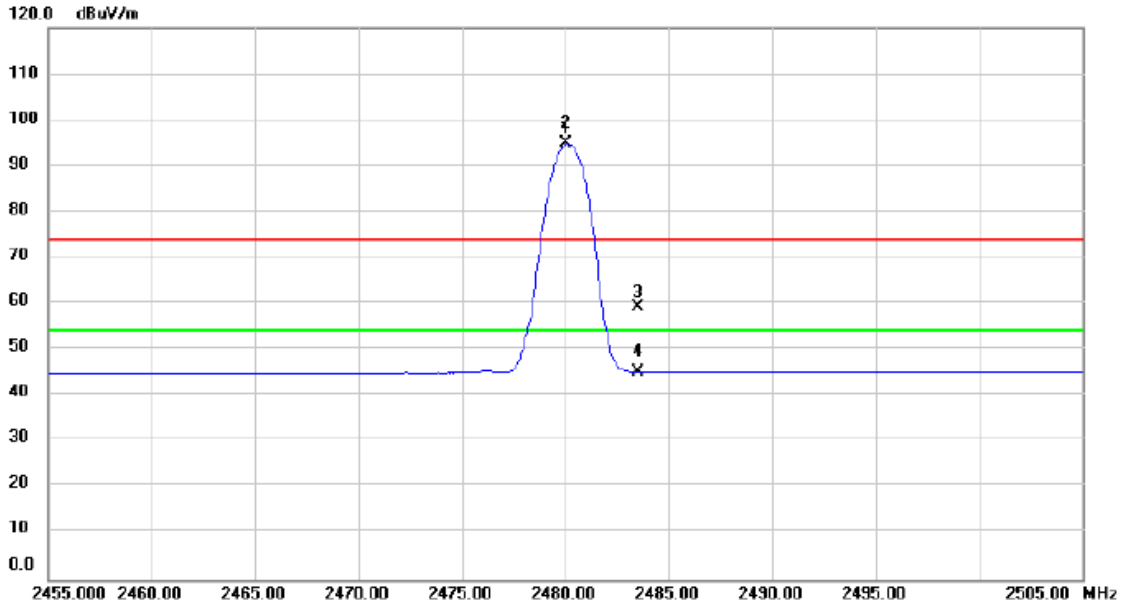
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4880.000	65.55	-10.39	55.16	74.00	-18.84	peak	
2	*	4880.000	63.24	-10.39	52.85	54.00	-1.15	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH39_1Mbps

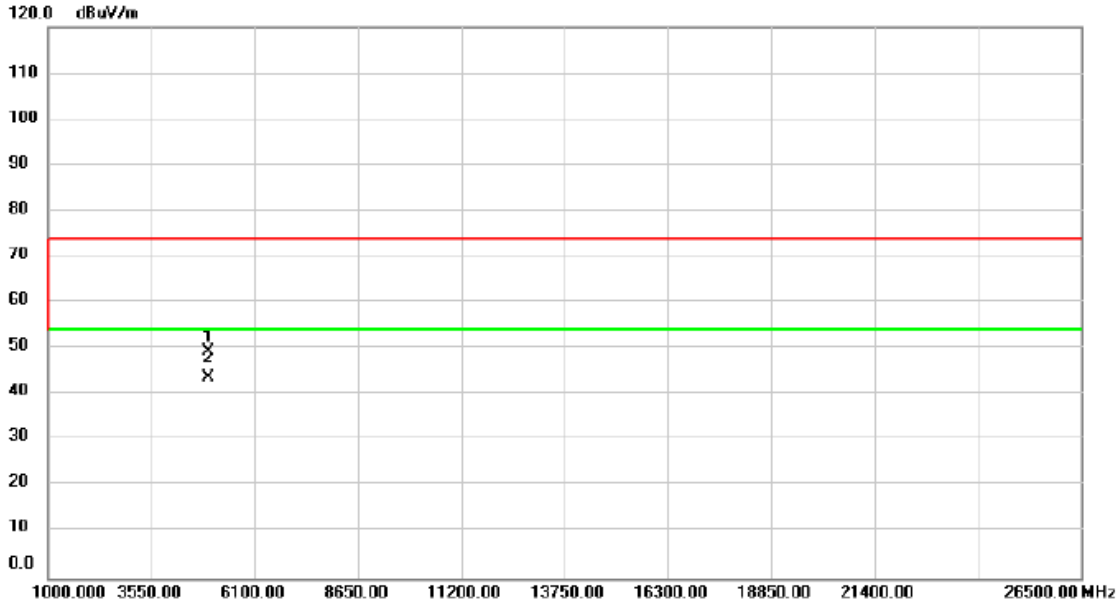
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2480.000	62.93	32.05	94.98	74.00	20.98	peak	No Limit
2	*	2480.000	62.85	32.05	94.90	54.00	40.90	AVG	No Limit
3		2483.500	27.28	32.06	59.34	74.00	-14.66	peak	
4		2483.500	13.23	32.06	45.29	54.00	-8.71	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH39_1Mbps

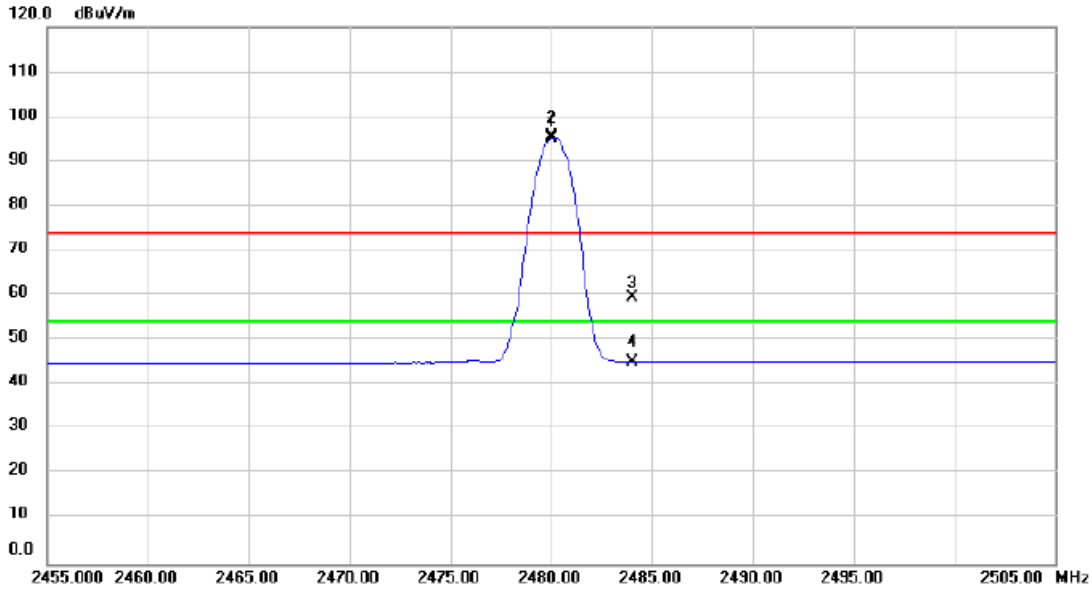
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	59.65	-10.26	49.39	74.00	-24.61	peak	
2	*	4960.000	53.94	-10.26	43.68	54.00	-10.32	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH39_1Mbps

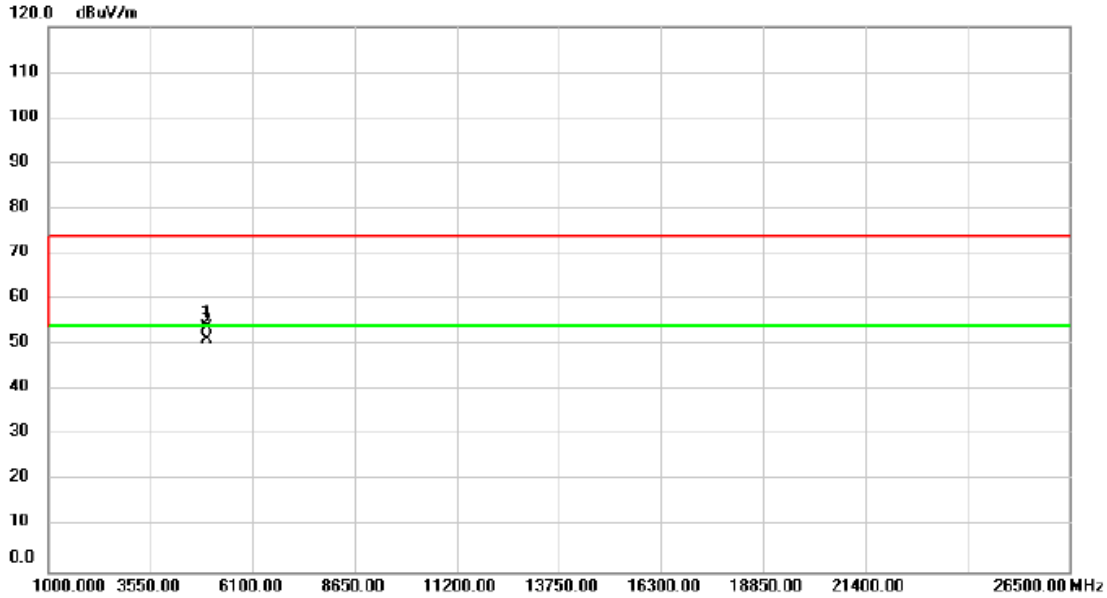
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	X	2480.000	63.43	32.05	95.48	74.00	21.48	peak	No Limit
2	*	2480.000	63.34	32.05	95.39	54.00	41.39	AVG	No Limit
3		2484.050	27.48	32.07	59.55	74.00	-14.45	peak	
4		2484.050	13.20	32.07	45.27	54.00	-8.73	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH39_1Mbps

Horizontal



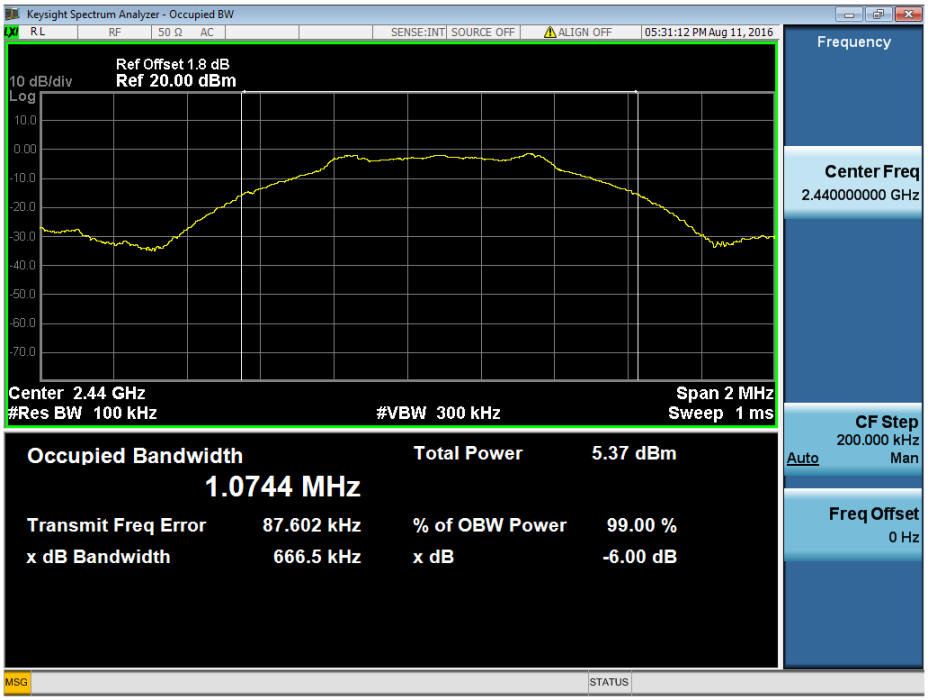
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	64.24	-10.26	53.98	74.00	-20.02	peak	
2	*	4960.000	61.30	-10.26	51.04	54.00	-2.96	AVG	

ATTACHMENT E - BANDWIDTH

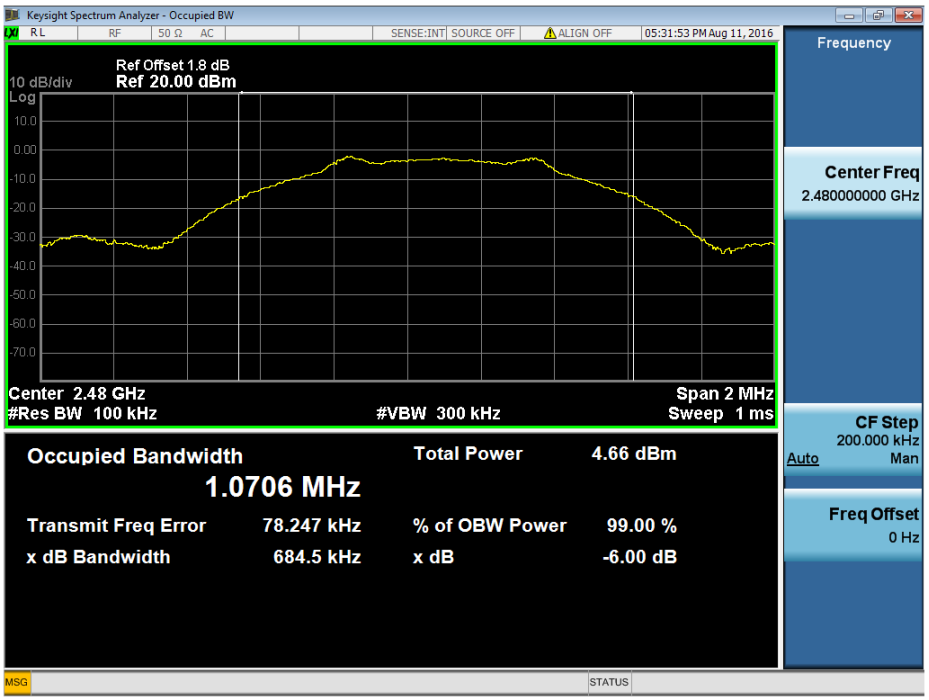
Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)	Test Result
2402	0.679	1.074	500	Complies
2440	0.667	1.074	500	Complies
2480	0.685	1.071	500	Complies

TX CH00

TX CH19



TX CH39



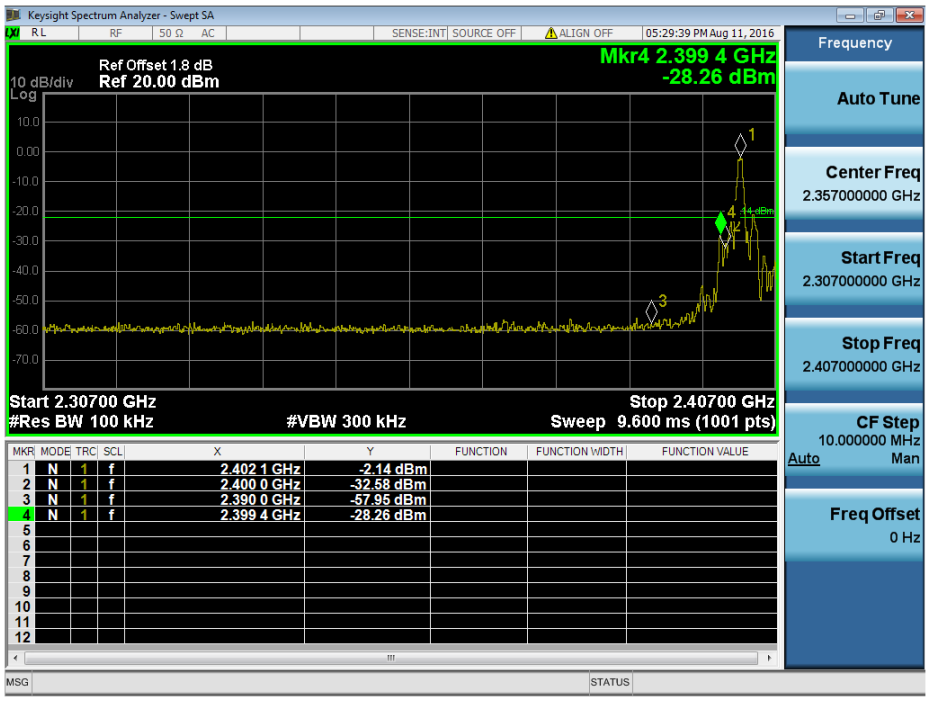
ATTACHMENT F - MAXIMUM OUTPUT POWER TEST

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (Watt)	Max. Limit (dBm)	Max. Limit (Watt)	Test Result
2402	0.17	0.0010	30.00	1.00	Complies
2440	-0.41	0.0009	30.00	1.00	Complies
2480	-0.75	0.0008	30.00	1.00	Complies

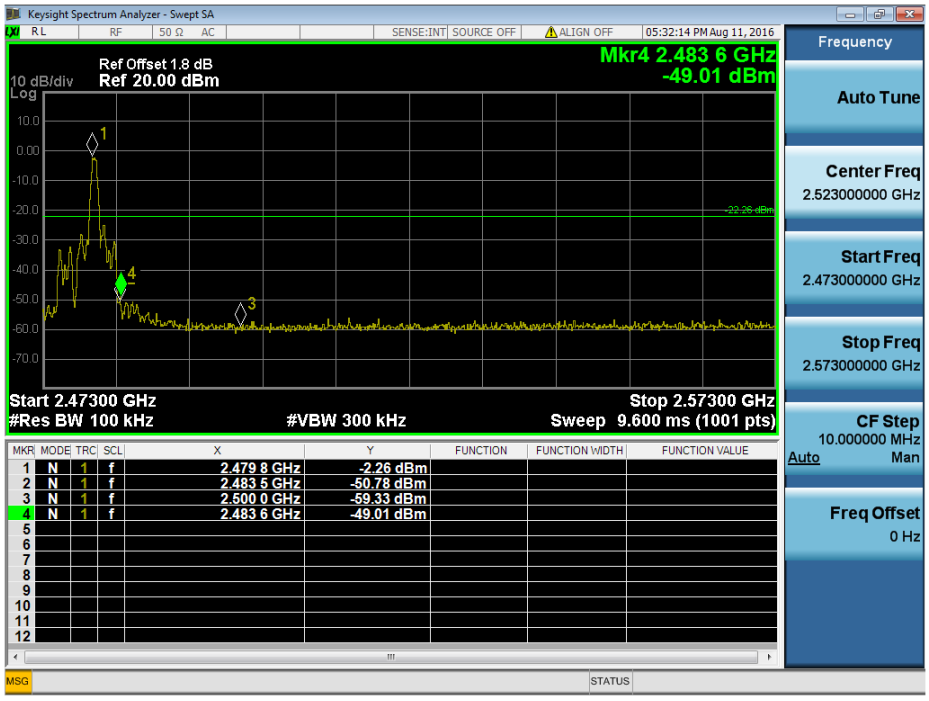
ATTACHMENT G - ANTENNA CONDUCTED SPURIOUS EMISSION

Test Mode :	CH00, CH19 , CH39 - 1Mbps

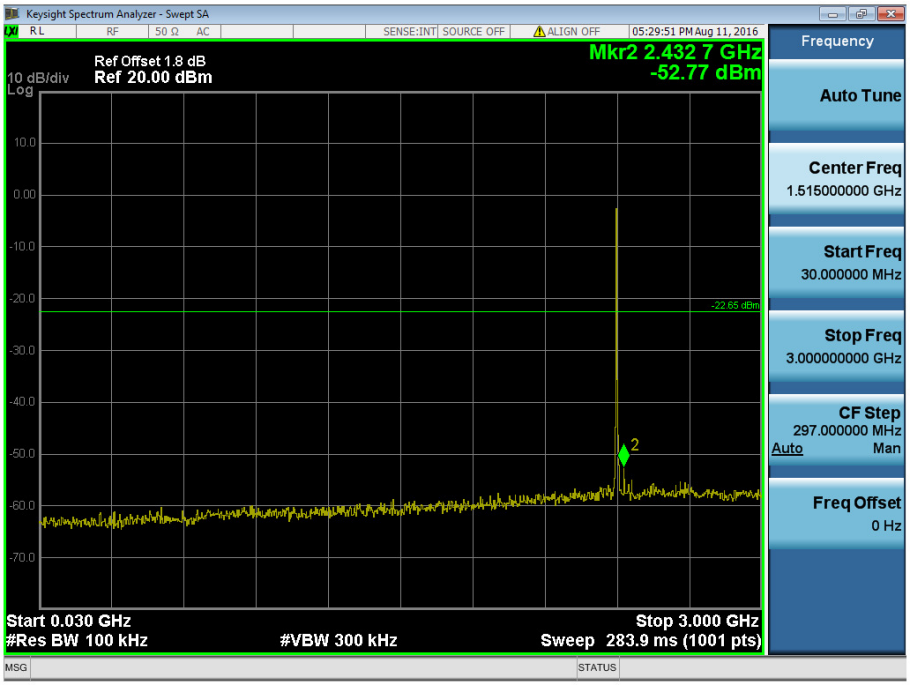
CH00 (Lower) - 1Mbps

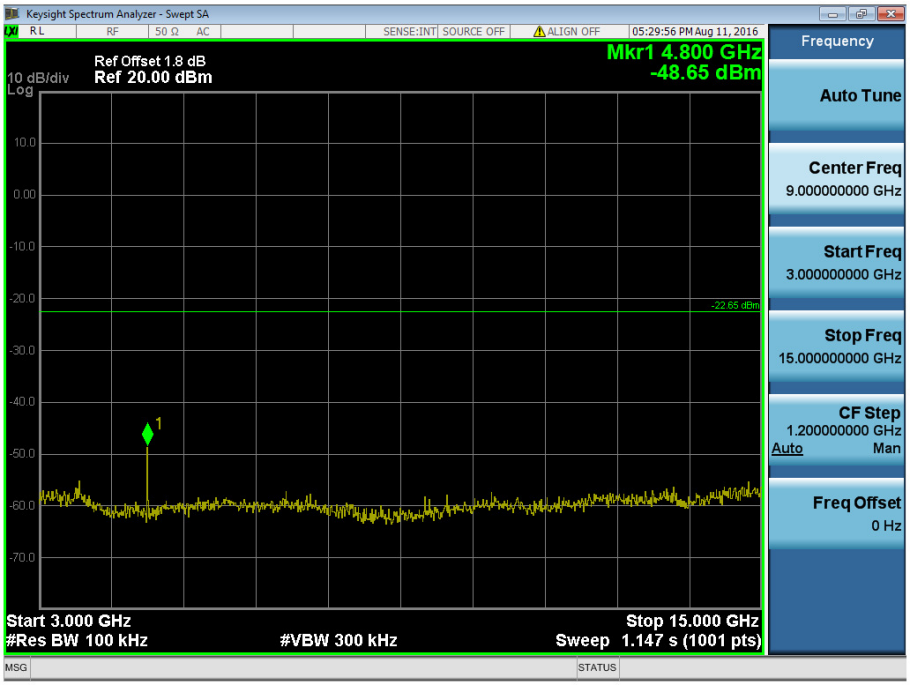


CH39 (upper) - 1Mbps



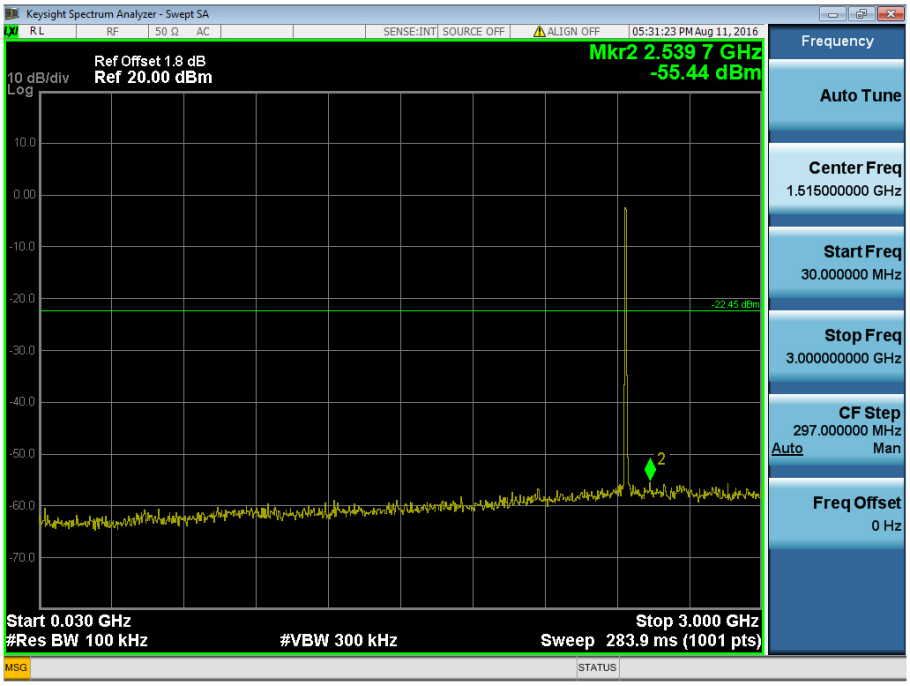
CH00 (10 Harmonic of the frequency)

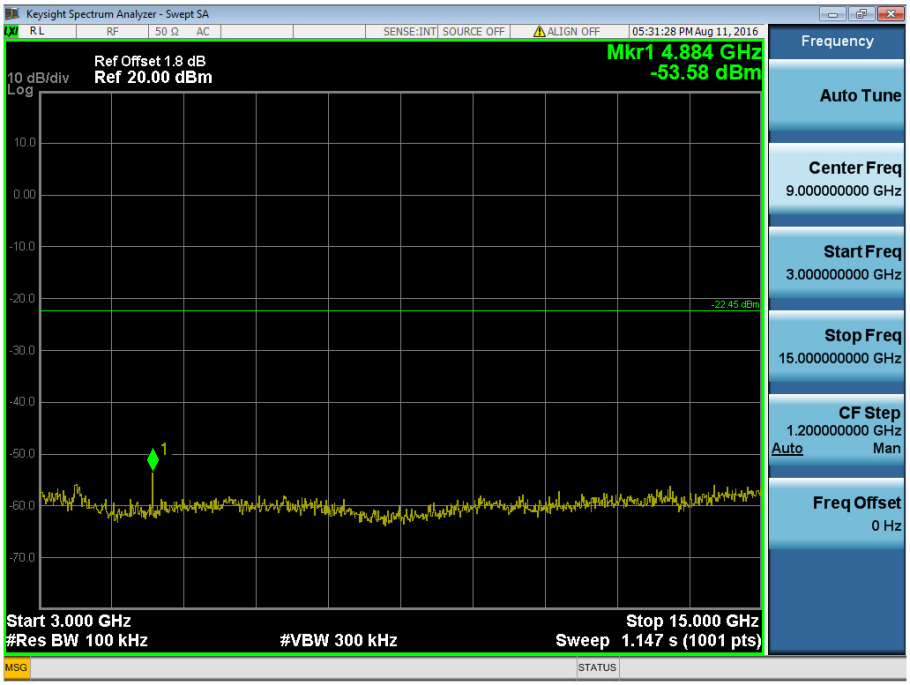




Keysight Spectrum Analyzer - Swept SA
R L
RF
50 Ω AC
SENSE:INT
SOURCE OFF
ALIGN OFF
05:30:01 PM Aug 11, 2016
Ref Offset 1.8 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 25.580 GHz
-46.60 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-22.65 dBm
1
Start 15.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.500 GHz
Sweep 1.099 s (1001 pts)
Frequency
Auto Tune
Center Freq
20.750000000 GHz
Start Freq
15.000000000 GHz
Stop Freq
26.500000000 GHz
CF Step
1.150000000 GHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

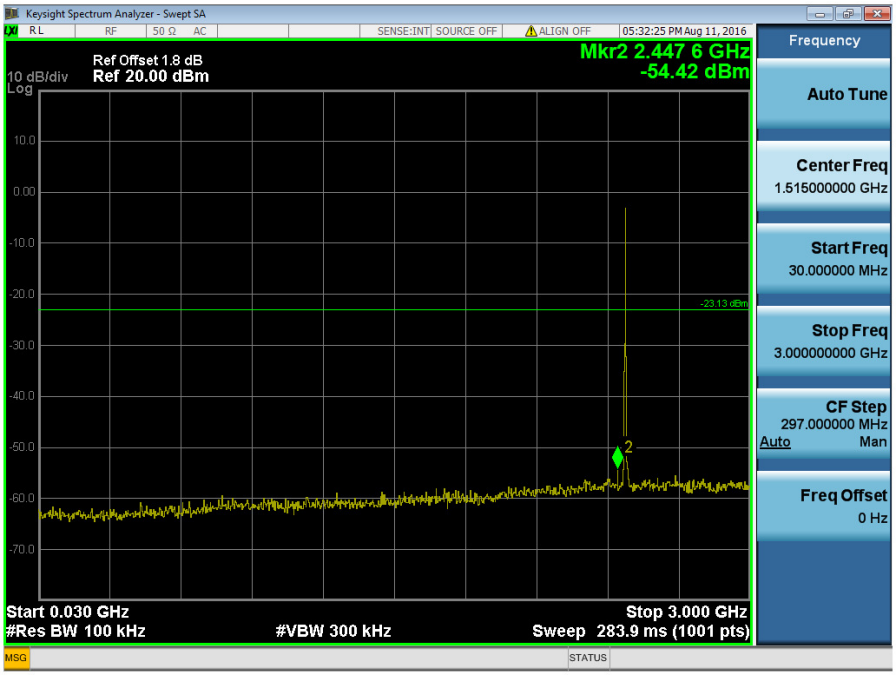
CH19 (10 Harmonic of the frequency)

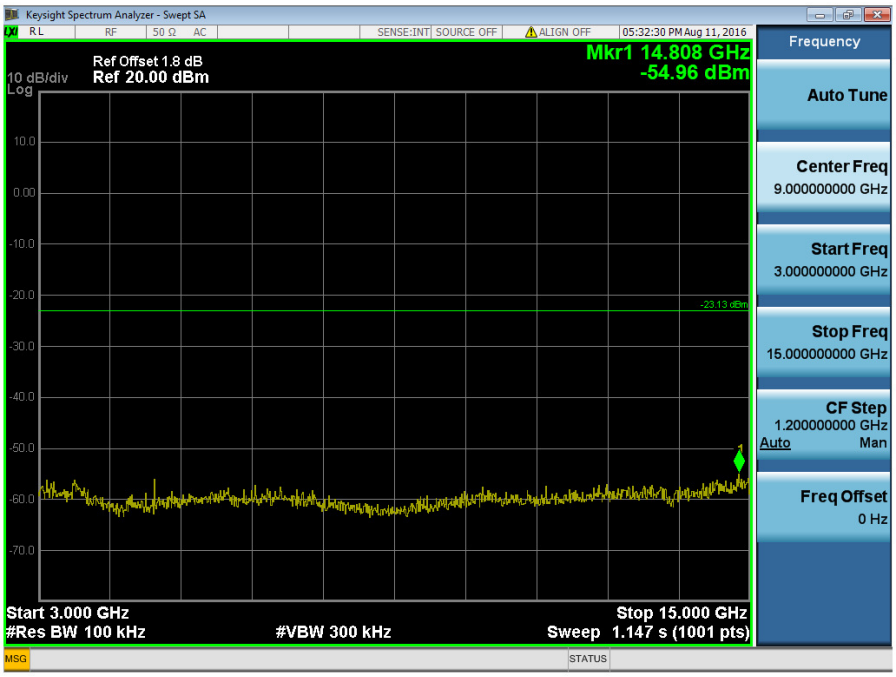




Keysight Spectrum Analyzer - Swept SA
R L
RF
50 Ω AC
SENSE:INT
SOURCE OFF
ALIGN OFF
05:31:32 PM Aug 11, 2016
Ref Offset 1.8 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 25.764 GHz
-46.89 dBm
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-22.45 dBm
1
Start 15.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.500 GHz
Sweep 1.099 s (1001 pts)
Frequency
Auto Tune
Center Freq
20.750000000 GHz
Start Freq
15.000000000 GHz
Stop Freq
26.500000000 GHz
CF Step
1.150000000 GHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

CH39 (10 Harmonic of the frequency)





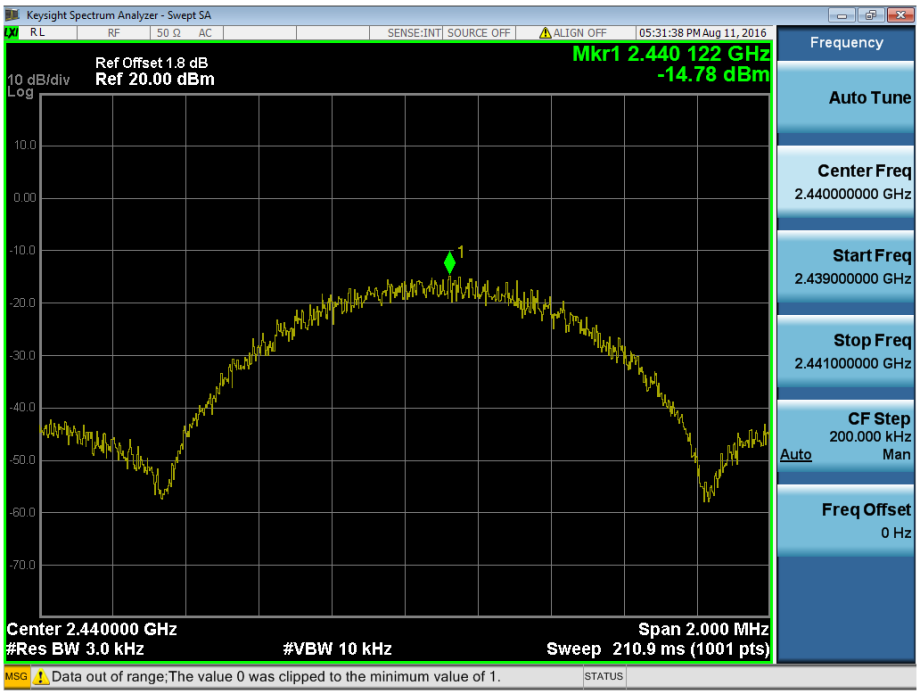
Keysight Spectrum Analyzer - Swept SA
RL
RF
50 Ω AC
SENSE:INT
SOURCE OFF
ALIGN OFF
05:32:35 PM Aug 11, 2016
Ref Offset 1.8 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 24.695 GHz
-47.48 dBm
10.0
0.00
-10.0
-20.0
-23.13 dBm
-30.0
-40.0
-50.0
-60.0
-70.0
1
Start 15.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.500 GHz
Sweep 1.099 s (1001 pts)
Frequency
Auto Tune
Center Freq
20.750000000 GHz
Start Freq
15.000000000 GHz
Stop Freq
26.500000000 GHz
CF Step
1.150000000 GHz
Auto
Man
Freq Offset
0 Hz
MSG
STATUS

ATTACHMENT H - POWER SPECTRAL DENSITY TEST

Frequency (MHz)	Power Density (dBm)	Max. Limit (dBm)	Result
2402	-14.82	8	Complies
2440	-14.78	8	Complies
2480	-14.90	8	Complies

TX CH00

TX CH19



TX CH39